

REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-42, 47, and 48 are presently active; Claims 1, 19, 25, 33, 41, 47, and 48 have been presently amended, Claims 43-46, 49, and 50 having been withdrawn by a Restriction Requirement.

In the outstanding Office Action, Claims 19-24 were rejected under 35 U.S.C. § 112, first paragraph, for failing to comply with the written description requirement. Claims 1, 7, 8, 11-16, 25, 27, 33, 35, and 47 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Publication No. 2003/0055523 to Bunkofske et al in view U.S. Publication No. 2002/0107858 to Lundahl et al and further in view of Li et al (“Recursive PCA for Adaptive Process Monitoring”). Claims 2-6, 19-23, 26, and 34 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bunkofske et al in view of Lundahl et al and Li et al and further in view of U.S. Pat. No. 6,622,059 to Toprac et al. Claims 9, 10, 28, and 36 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bunkofske et al in view of Lundahl et al and Li et al and further in view of U.S. Pat. No. 5,796,606 to Spring. Claims 17, 18, 29-32, 37-42, and 48 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bunkofske et al in view of Lundahl et al and Li et al and further in view of U.S. Publication No. 2003/0144746 to Hsiung et al. Claim 24 was rejected under 35 U.S.C. § 102(a) as being unpatentable over Bunkofske et al, Lundahl et a, Li et al, and Toprac et al in view of U.S. Pat. No. 5,796,6007 to Spring.

Applicant's acknowledge with appreciation the courtesy of Examiner West to interview this case on June7, 2007 during which time the issues in the outstanding Office Action were discussed as substantially summarized hereinafter. As noted on the Interview Summary Sheet,

proposed ways of overcoming the 35 U.S.C. § 112, first paragraph, rejection and the 35 U.S.C. § 103(a) rejection were discussed during the interview.

Regarding the 35 U.S.C. § 112, first paragraph, rejection, Claim 19 has been amended to clarify that the improved process center produces an output assessing the process being performed in the processing system. Thus, as discussed during the interview, the 35 U.S.C. § 112, first paragraph, rejection has been overcome.

Regarding the rejections on the merits, the independent claims define:

acquiring initial data from said processing system for a plurality of observations from a first set of substrate runs having performed a process in the processing system, said initial data comprising a plurality of data parameters;

constructing a principal components analysis (PCA) model from said data parameters of the first set, said PCA model including centering coefficients for the initial data from the first set;

acquiring additional data from said processing system after said constructing step from a second set of substrate runs performing said process in the processing system, said additional data comprising an additional observation of said plurality of data parameters;

adjusting said centering coefficients ***at the time of each observation of the additional data*** from the second set by utilizing both said initial data and current data obtained from the additional observation from the process performed in the second set to produce updated adaptive centering coefficients for each of said data parameters in said PCA model;

applying said updated adaptive centering coefficients to each of said data parameters in said PCA model ***created from the first set of substrate runs and unchanged.***¹ [Emphasis added.]

The outstanding Office Action states that the invention of Bunkofske et al and Lundahl et al is modified by the invention of Li et al to specify that the method acquire additional data from the processing system after constructing the PCA model to form adjusted data and adjusted centering/sealing coefficients.

However, as discussed during the interview, Li et al disclose a process in section 2.2 “*Recursive correlation matrix calculation*” in which ***the PCA model itself is recalculated.***

¹ Support for the added feature of the PCA model “created from the first set of substrate runs and unchanged” is found in Applicant’s Figure 12 and the discussion thereof in the specification on page 23.

Li et al specifically disclose in formula (14) a special case for the recursive relationship “if the model needs to be updated after every new sample is taken.” For example, Li et al disclose at the end of Section 3. “*RPCA by rank-one modification*” formula (19) for updating the RPCA model after each sample.

Li et al then point out that a major drawback of the rank-one modification is the extensive computational burden required. To avoid the extensive computational burden, Li et al disclose in Section 4 “*RPCA by the Lanczos tridiagonalization*” a technique in which selected new principle eigenpairs for the largest eigenvalues in the existing model are recalculated from an orthogonalization process based on new input data. Applicant submits that recalculating eigenpairs and eigenvalues constitutes the generation of a new PCA model.

As pointed out during the interview, Applicant also recognized the extensive computational burden in recalculating the PCA model after each run. Applicant’s numbered paragraph [0087] in the filed specification states that:

While methods are known for preserving the usefulness of the PCA model over long process runs, the present inventors have recognized that these methods are not practical for commercial application to semiconductor manufacturing process control. For example, using an adaptive model technique, the PCA model can be actually rebuilt with each process run in order to update the model on the fly during the process. While this adaptive modeling technique may generally stabilize the statistical monitoring within a given control limit, it requires computational resources not practical for commercial processes.

As discussed during the interview, Li et al teach a process different than that taught and claimed by the Applicant. Li et al either recalculate a PCA model after every new sample is taken or, to avoid the extensive computational burden, recalculate the largest principle eigenvectors which, while saving computational time, nevertheless generates a new principle components model, as discussed above.

Regardless, in both cases, Li et al teach the recalculation of a PCA model based on new input data. Thus, even if Li et al were considered to teach adjusting centering coefficients at

the time of each observation of the additional data from a second set of substrate runs, those adjusted centering coefficients would be applied to a new PCA model, not the PCA model created from a first set of substrate runs and unchanged, as presently clarified.

Accordingly, Li et al do not teach adjusting centering coefficients at the time of each observation of the additional data from a second set of substrate runs to produce updated adaptive centering coefficients and applying the updated adaptive centering coefficients to each of the data parameters in the PCA model created from the first set of substrate runs and unchanged, as defined in the presently pending claims.

Hence, a combination of Bunkofske, Lundahl et al, and Li et al would not produce or suggest the claimed invention in which, for each additional data observation, updated adaptive centering coefficients (based on the new data) are applied to the initial PCA model.

Thus, for all these reasons, Claims 1, 19, 25, 33, 41, 47, and 48 and the claims dependent therefrom are believed to patentably define over the references in the outstanding Office Action.

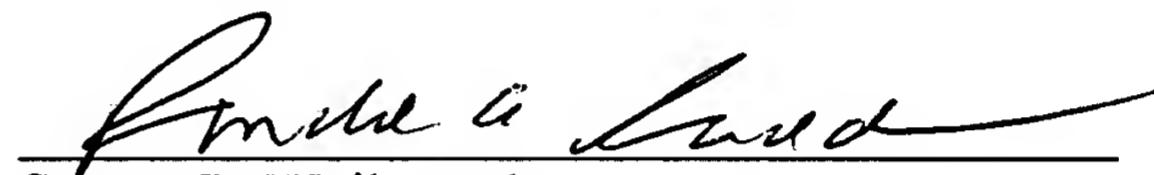
Lastly, it is requested that the examiner consider and acknowledge the Information Disclosure Statement filed in this case on March 21, 2007 after issue of the outstanding Office Action.

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Consequently, in view of the present amendment and in light of the above discussions, the outstanding grounds for rejection are believed to have been overcome. The application as amended herewith is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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